

LIST OF FIGURES

Figure 1-1. Roadmap of the NAS Architecture Document	1-1
Figure 2-1. The NAS	2-4
Figure 2-2. NAS Functional Domains	2-5
Figure 2-3. Modernization is an Aviation-Community-Wide Task	2-6
Figure 2-4. The NAS Architecture in Context	2-7
Figure 2-5. The NAS Architecture and the Acquisition Management System	2-8
Figure 4-1. Collaboration and Information Sharing	4-3
Figure 4-2. Improved Surface Operations	4-4
Figure 4-3. Improved Surface Movement Detection	4-6
Figure 4-4. More Efficient Operations for Arrivals and Departures	4-7
Figure 4-5. Aircraft Fly Preferred Routes	4-8
Figure 4-6. Improved Oceanic Operations	4-10
Figure 5-1. Modernization Phases	5-2
Figure 5-2. Increased Navigation/Landing Position Accuracy and Site Availability, Air Traffic Services Arrival/Departure, Phase 1 (1998–2002)	5-5
Figure 5-3. Increased Navigation/Landing Position Accuracy and Site Availability, Air Traffic Services Arrival/Departure, Phase 2 (2003–2007)	5-6
Figure 5-4. Increased Navigation/Landing Position Accuracy and Site Availability, Air Traffic Services En Route/Cruise, Phase 1 (1998–2002)	5-6
Figure 9-1. Goal of Information Security	9-2
Figure 9-2. Relationships Between Major INFOSEC Elements	9-2
Figure 9-3. Estimated INFOSEC Costs	9-6
Figure 12-1. Estimated Personnel Costs	12-3
Figure 13-1. Estimated NAS Architecture Costs	13-1
Figure 13-2. Estimated R,E&D Costs	13-2
Figure 13-3. Estimated Architecture F&E Costs	13-3
Figure 13-4. Estimated Architecture OPS Costs	13-3
Figure 13-5. Estimated OPS Costs	13-4
Figure 14-1. Roadmap of Functional Areas	14-1
Figure 14-2. Functional Area Architectural Steps	14-1
Figure 15-1. Current Navigation Architecture	15-2
Figure 15-2. GPS Augmented by WAAS	15-3
Figure 15-3. Wide Area Augmentation System	15-5
Figure 15-4. GPS Augmented by LAAS	15-6
Figure 15-5. LAAS Architecture Overview	15-7
Figure 15-6. Ground-Based Navaids Phased Out	15-8
Figure 15-7. Navigation and Landing Capabilities Summary	15-9
Figure 15-8. Navigation and Landing Transition	15-10
Figure 15-9. Estimated Navigation Costs	15-11
Figure 16-1. Proposed Surveillance System Architecture	16-3
Figure 16-2. Surveillance Capabilities Summary	16-7
Figure 16-3. Major Surveillance Systems Transition	16-9
Figure 16-4. Estimated Surveillance Costs	16-10
Figure 17-1. Logical Network Architecture	17-2
Figure 17-2. Interfacility Architecture in 2008	17-5
Figure 17-3. Interfacility Communications Transition	17-6
Figure 17-4. Intrafacility Architecture in 2004	17-8

Figure 17-5. Intrafacility Architecture in 2010	17-9
Figure 17-6. Intrafacility Communications Transition.....	17-9
Figure 17-7. Mobile Communications Architecture in 2005	17-11
Figure 17-8. Mobile Communications Architecture in 2015	17-12
Figure 17-9. Mobile Communications Transition	17-13
Figure 17-10. Data Link Services Capabilities Summary	17-17
Figure 17-11. Estimated Interfacility Communications and Data Link Costs	17-17
Figure 18-1. Ground Infrastructure Transition Supporting Avionics Equipage.....	18-7
Figure 19-1. Evolution of Collaboration and Information Exchange.....	19-1
Figure 19-2. Seamless Information Flow in the NAS	19-2
Figure 19-3. Evolution From Existing Information Systems to Future Systems	19-3
Figure 19-4. Three Levels of NAS Information Services	19-5
Figure 19-5. High-Level View of the Flight Object.....	19-6
Figure 19-6. Collaborative Decisionmaking in the Future NAS and Electronic Data Exchange for Collaboration	19-7
Figure 19-7. Collaboration and Information-Sharing Transition	19-9
Figure 19-8. Estimated Collaboration and Information-Sharing Costs.....	19-10
Figure 20-1. TFM Evolution	20-2
Figure 20-2. TFM Capabilities Summary.....	20-9
Figure 20-3. TFM Transition.....	20-10
Figure 20-4. Estimated TFM Costs	20-11
Figure 21-1. En Route Architecture Evolution.....	21-2
Figure 21-2. En Route Architecture Evolution—Step 1 (Current–1999).....	21-4
Figure 21-3. En Route Architecture Evolution—Step 2 (2000–2004).....	21-5
Figure 21-4. En Route Architecture Evolution—Reengineered En Route— Step 3 (2005–2007).....	21-7
Figure 21-5. En Route Architecture Evolution—Enhanced En Route— Step 4 (2008–2015).....	21-8
Figure 21-6. Redundant Functionality in En Route Architecture.....	21-10
Figure 21-7. En Route Capabilities Summary.....	21-11
Figure 21-8. En Route Transition	21-13
Figure 21-9. Estimated En Route Automation Costs	21-13
Figure 22-1. Oceanic Airspace	22-1
Figure 22-2. Oceanic Architecture Evolution Toward Commonality	22-2
Figure 22-3. Overall Oceanic Architecture Evolution.....	22-5
Figure 22-4. Oceanic Architecture Evolution—Step 1 (Current–1999).....	22-6
Figure 22-5. Oceanic Architecture Evolution—Step 2 (2000–2002).....	22-7
Figure 22-6. Oceanic Architecture Evolution—Step 3 (2003–2007).....	22-8
Figure 22-7. Oceanic Architecture Evolution—Step 4 (2008 and Beyond).....	22-9
Figure 22-8. Offshore Architecture Evolution—Step 1 (Current–1999)	22-11
Figure 22-9. Offshore Architecture Evolution—Step 2 (2000–2004).....	22-13
Figure 22-10. Offshore Architecture Evolution—Step 3 (2005–2007).....	22-13
Figure 22-11. Offshore Architecture Evolution—Step 4 (2008 and Beyond)	22-14
Figure 22-12. Oceanic and Offshore Operational Improvements	22-15
Figure 22-13. Oceanic and Offshore Transition	22-17
Figure 22-14. Estimated Oceanic and Offshore Costs	22-18
Figure 23-1. Terminal Architecture Evolution	23-2
Figure 23-2. Terminal Architecture Evolution—Step 1 (Current–2000)	23-3

Figure 23-3. Terminal Architecture Evolution—Step 2 (2001–2004)	23-5
Figure 23-4. Terminal Architecture Evolution—Step 3 (2005–2007)	23-7
Figure 23-5. Terminal Architecture Evolution—Step 4 (2008–2015)	23-9
Figure 23-6. Terminal Architecture Evolution.....	23-10
Figure 23-7. Terminal Automation Transition	23-11
Figure 23-8. Estimated Terminal Automation Costs.....	23-12
Figure 24-1. Future Airport Traffic Control Tower Functional Architecture	24-2
Figure 24-2. Airport Traffic Control Tower Architecture Evolution.....	24-3
Figure 24-3. Airport Traffic Control Tower Architecture Evolution—Step 1 (Current–2002)	24-4
Figure 24-4. Airport Traffic Control Tower Architecture Evolution—Step 2 (2003–2005)	24-5
Figure 24-5. Airport Traffic Control Tower Architecture Evolution—Step 3 (2006–2007)	24-6
Figure 24-6. Airport Traffic Control Tower Architecture Evolution—Step 4 (2008–2015)	24-7
Figure 24-7. Tower and Airport Surface Capabilities Summary	24-8
Figure 24-8. Airport Traffic Control Tower Architecture Transition	24-9
Figure 24-9. Estimated Airport Traffic Control Tower Automation Architecture Costs.....	24-9
Figure 25-1. Flight Services Architecture—Step 1 (1998)	25-2
Figure 25-2. Flight Services Architecture—Step 2 (1999–2005)	25-3
Figure 25-3. Flight Services Architecture—Step 3 (2006–2015)	25-4
Figure 25-4. Flight Services Capabilities Summary	25-5
Figure 25-5. Flight Services Transition.....	25-5
Figure 25-6. Estimated Flight Services Automation Costs	25-6
Figure 26-1. Weather Architecture Evolution—Step 1 (1998)	26-2
Figure 26-2. Weather Architecture Evolution—Step 2 (1999–2002)	26-4
Figure 26-3. Weather Architecture Evolution—Step 3 (2003–2008)	26-6
Figure 26-4. Weather Architecture Evolution—Step 4 (2009–2015)	26-8
Figure 26-5. Aviation Weather Capabilities Summary	26-9
Figure 26-6. Weather Systems Transition	26-10
Figure 26-7. Estimated Weather Systems Costs	26-11
Figure 27-1. Infrastructure Management Architecture Evolution—Step 1 (1996–1997)	27-3
Figure 27-2. Infrastructure Management Architecture Evolution—Step 2 (1998–2002).....	27-4
Figure 27-3. Infrastructure Management Architecture Evolution—Step 3 (2003–2005)	27-5
Figure 27-4. Infrastructure Management Architecture Evolution—Step 4 (2006–2015)	27-6
Figure 27-5. Infrastructure Management Transition	27-8
Figure 27-6. Estimated Infrastructure Management Costs.....	27-8
Figure 29-1. Estimated Facilities Costs.....	29-5
Figure 30-1. Estimated Environment and Energy Costs	30-3
Figure 31-1. Estimated Mission Support Costs.....	31-6

LIST OF TABLES

Table 7-1. Accident Trends	7-6
Table 7-2. Incident Trends.....	7-6
Table 11-1. Preliminary Analysis of Regulations Affected by the Baseline Architecture.....	11-5
Table 18-1. Estimated Avionics Costs (1998 Dollars).....	18-8
Table 22-1. Oceanic Capabilities Evolution.....	22-3
Table 22-2. Evolution of Events in Oceanic Domain.....	22-4
Table 22-3. Offshore Evolution Events.....	22-11
Table 29-1. Average Age of Key NAS Facilities.....	29-1
Table 29-2. New TRACON Consolidations.....	29-2